

EXPERIMENTAL TELEVISION CENTER LTD.  
164 COURT ST.  
BINGHAMTON NEW YORK 13901  
607-723-9509

A Computer-Based Video Synthesizer System

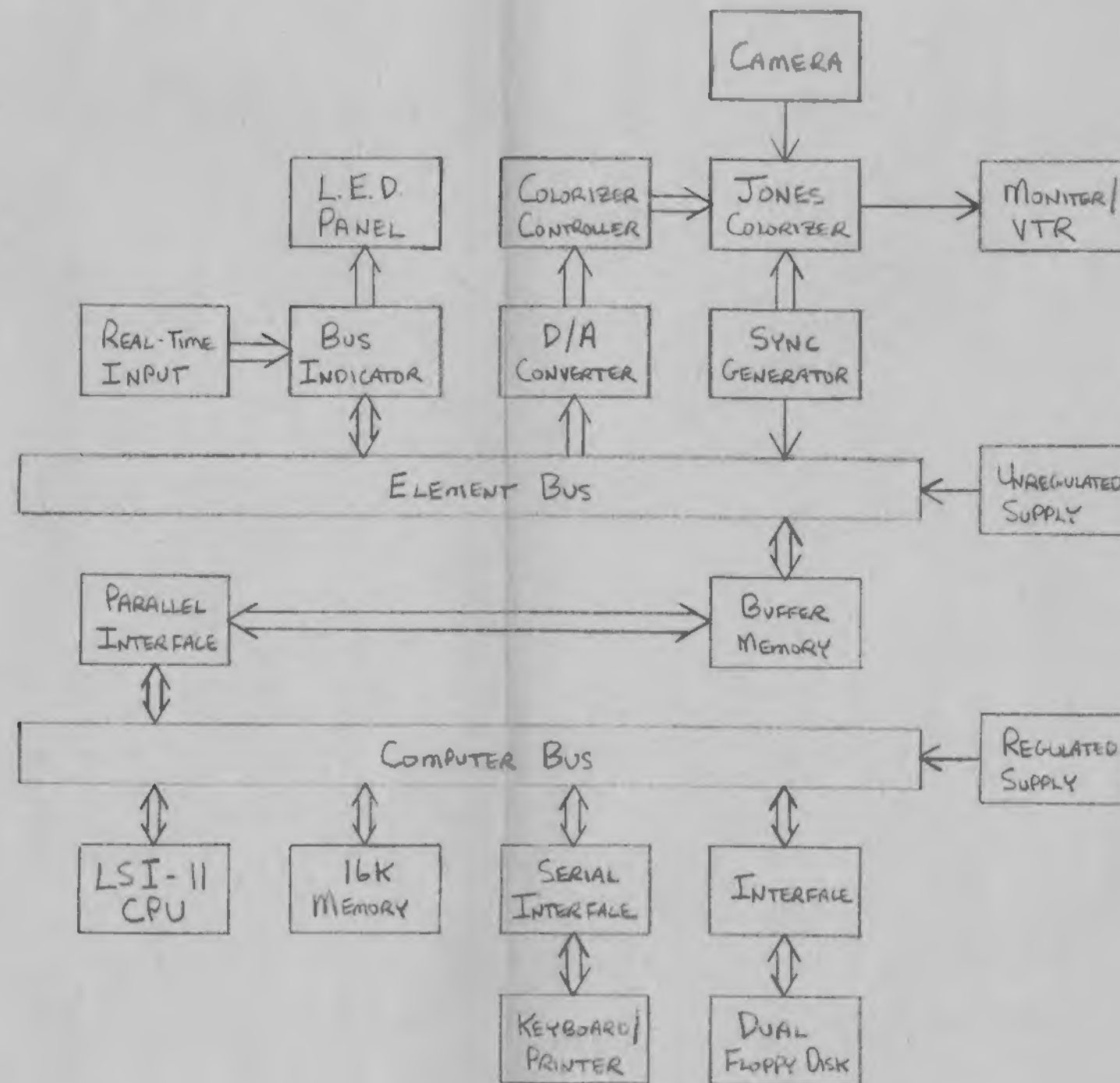
Hardware Documentation

Richard Brewster

Experimental Television Center Ltd.  
Binghamton, New York

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EXPERIMENTAL TV CENTER, LTD.  
 BINGHAMTON, N.Y.  
 COMPUTER - BASED  
 PROCESSING VIDEO SYNTHESIZER  
 SYSTEM DIAGRAM, 9/77 R.B.



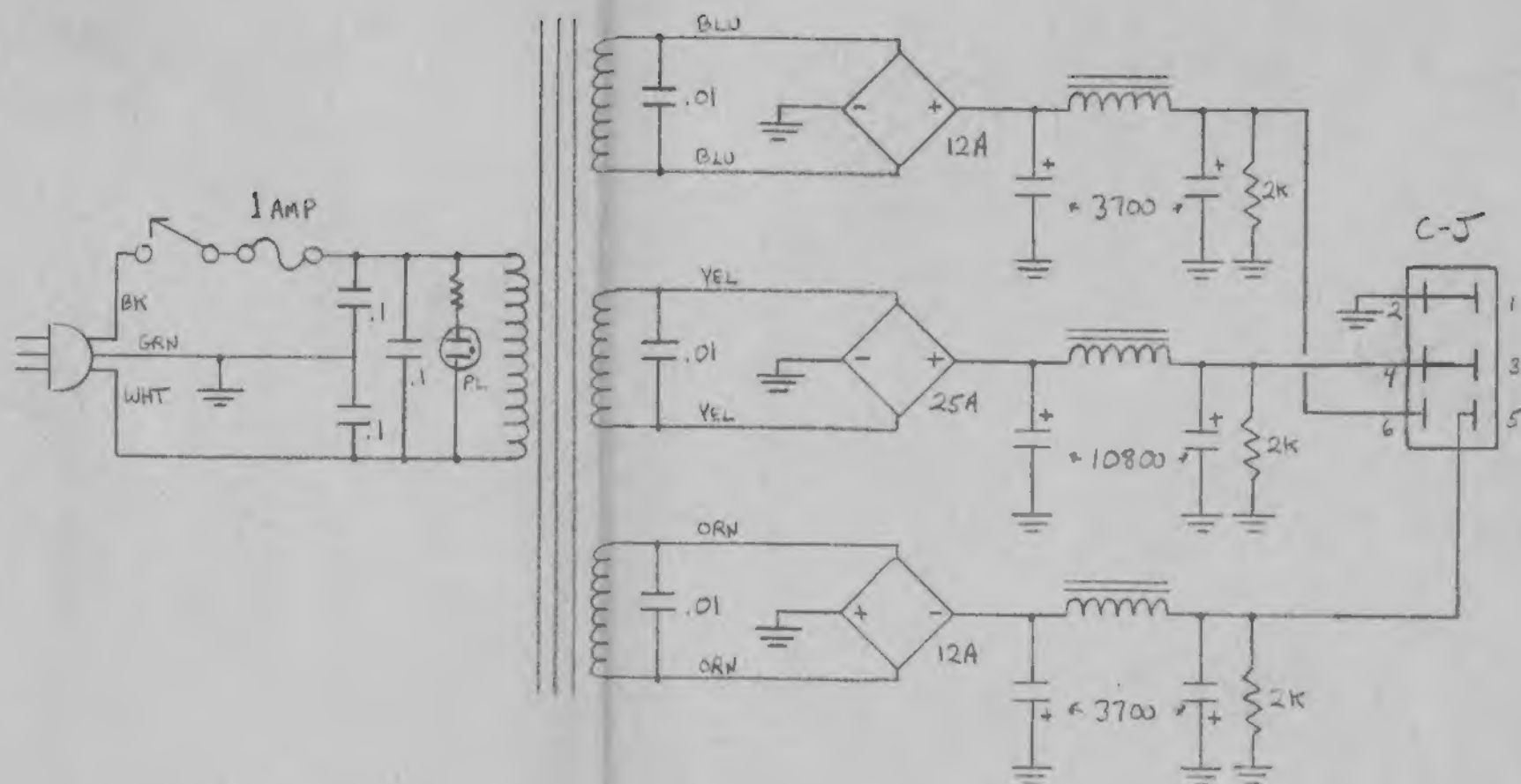
EXPERIMENTAL TV CENTER, LTD.  
BINGHAMTON, N.Y.  
COMPUTER PROJECT  
ELEMENT BUSS POWER SUPPLY  
6/77 RICH BREWSTER  
PAGE 1 OF 1

PARTS LIST:

- TRANSFORMER - BASLER BE12696-001  
2 BRIDGE RECTIFIERS 200 PIV 12Amp  
1 BRIDGE RECTIFIER 400 PIV 25Amp  
3 CHOKES, 20 AMP,  $\leq .05$  ohm  
4 CAPACITORS, 3700 MFD AT 75V  
2 CAPACITORS, 10800 MFD AT 20V  
3 RESISTORS, 2000 ohm  $\frac{1}{2}$  WATT  
1 FUSE HOLDER w/ 1AMP SLO-BLO FUSE  
3 CAPACITORS, .01 MFD 100V MYLAR  
3 CAPACITORS, .1 MFD 600V  
1 NEON PILOT LAMP ASSEMBLY  
1 S.P.S.T. TOGGLE SWITCH, 6 AMP 120V  
1 LINE CORD, 3 WIRE, 120V  
1 CINCH-JONES CONNECTOR, 6 PIN,  
CHASSIS MOUNTED FEMALE  
1 ALUMINUM CHASSIS 3"x7"x15"

CABLE PARTS:

- 1 C-J MALE, CABLE MOUNT, 6 PIN  
1 C-J FEMALE, CABLE MOUNT, 6 PIN  
10' 7-CONDUCTOR, 18 GAUGE CABLE



CONNECTOR	CABLE	VOLTAGE	CURRENT
1,2	BLK, GRN, BRN	GND	
3,4	WHT, RED	+9V	6A
5	BLU*	-19V	2A
6	ORN*	+19V	2A

\* NOTE - THESE ARE THE CABLE COLORS, NOT THE TRANSFORMER LEADS WHICH HAPPEN TO BE THE OPPOSITE COLORS.

## ELEMENT BUS

1	+9V	51	+9V
2	+19V	52	-19V
3	XRDY	53	SSW DSB
4	Q1	54	EXT CLR
5	Q2	55	
6	Q3	56	BYTE
7	ETF	57	DIO8
8	CEM	58	DIO9
9	CME	59	DIO10
10	FTE	60	DIO11
11	TR	61	DIO12
12	X CLOCK	62	DIO13
13	X LOAD	63	DIO14
14	Y CLOCK	64	DIO15
15	Y LOAD	65	
16	HDTTL	66	SCTTL
17	VDSYNC	67	
18	STA DSB	68	MWRT
19	C/C DSB	69	PS
20	UNPROT	70	PROT
21	SS	71	RUN
22	ADD DSB	72	PRDY
23	DO DSB	73	PINT
24	Q2	74	PHOLD
25	Q1	75	PRESET
26	PHLDA	76	PSYNC
27	PWAIT	77	WE
28	PINTE	78	RE
29	A5	79	A0
30	A4	80	A1
31	A3	81	A2
32	A15	82	A6
33	A12	83	A7
34	A9	84	A8
35	D1	85	A13
36	D0	86	A14
37	A10	87	A11
38	D4	88	D2
39	D5	89	D3
40	D6	90	D7
41	DI2	91	DI4
42	DI3	92	DI5
43	DI7	93	DI6
44	SM1	94	DI1
45	SOUT	95	DI0
46	SINP	96	SINTA
47	SMEMR	97	SNO
48	SHLTA	98	SSTACK
49	CLOCK	99	POC
50	GND	100	GND

## DON SIGNALS

Q1	}	From BUFFER MEMORY
Q2		
Q3		
CEM		
CME	}	From BUS INDICATOR
ETF		
FTE		
TR		
VD SYNC		
A0 - A9		
D0 - D7		
DIO8 - DIO15		

## JEFF SIGNALS

X CLOCK
X LOAD
Y CLOCK
Y LOAD
HDTTL
SCTTL
WE (PWR)
RE (INVERSE PDBIN)
BYTE

## NOTES

- ① PIN 17 CARRIES NEGATIVE GOING V.D, TR IS THE SAME AS VDTTL.
- ② D0 - D7 ARE DATA OUT FOR ALTAR, AND DATA IN-OUT FOR DON'S SYSTEM.
- ③ SIGNALS OTHER THAN DON'S OR JEFF'S ARE TAKEN FROM THE ALTAR 8800 BUS STRUCTURE.
- ④ PINS 4-11 ARE DESIGNATED "VECTORED INTERRUPT LINES" IN THE ALTAR BUS.
- ⑤ Q1 AND Q2 ARE DON SIGNALS THAT ARE UNRELATED TO Q1 AND Q2 ALTAR SIGNALS.

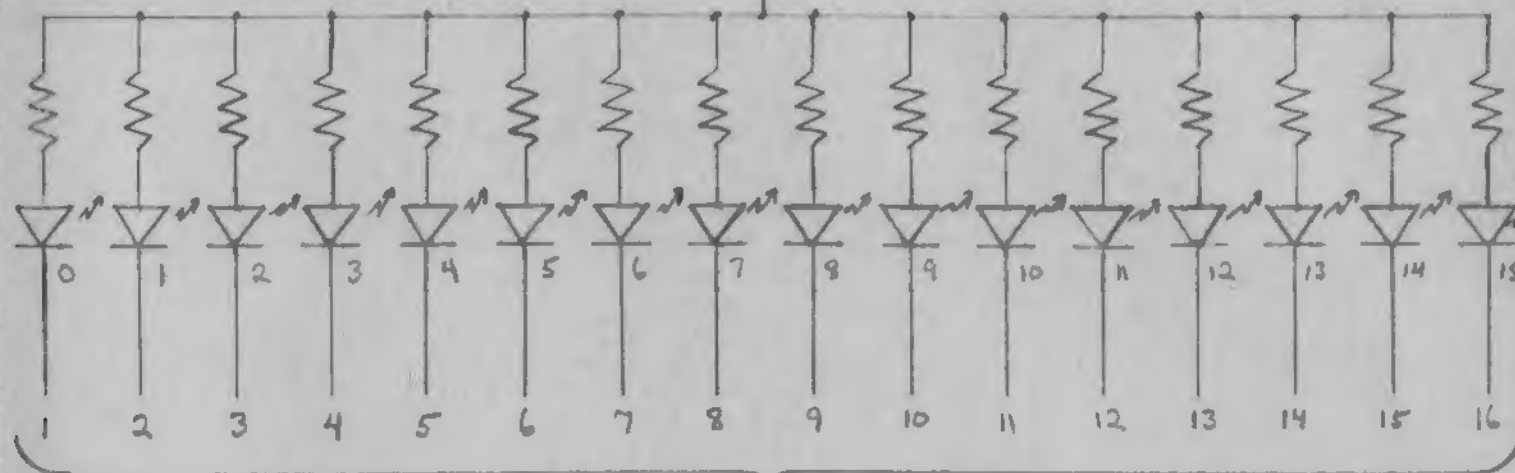
EXPERIMENTAL TV CENTER, LTD.  
 BINGHAMTON, N.Y.  
 COMPUTER PROJECT 9/77  
 ELEMENT BUS R.B.



## BUS INDICATOR LED PANEL

ALL RESISTORS 910 OHMS

+5V (FROM COMPUTER BUS SUPPLY)

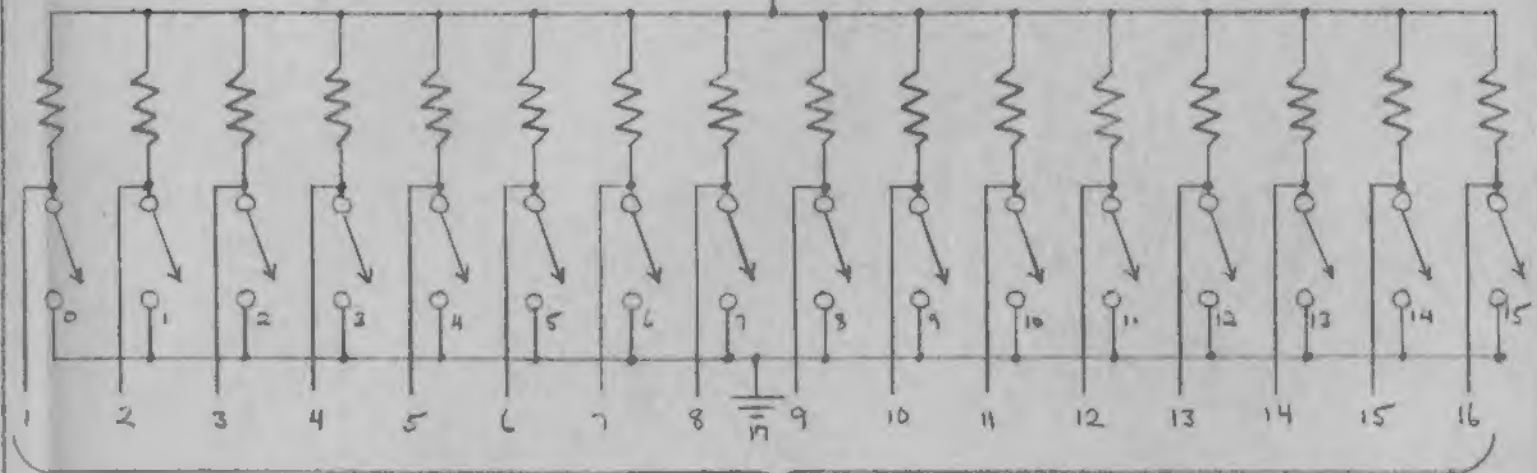


DIP PLUG

## REAL TIME INPUT BOX

ALL RESISTORS 1K OHMS

+5V (PIN 18, "D" CONNECTOR)



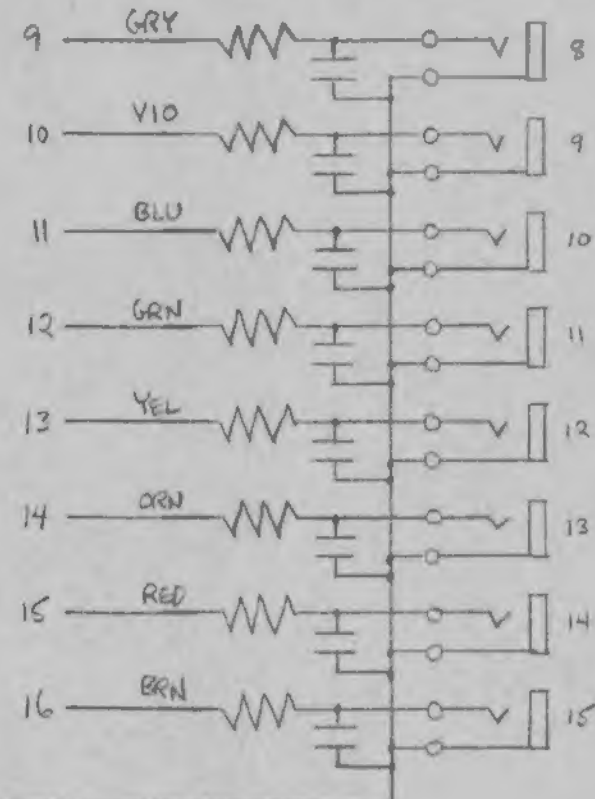
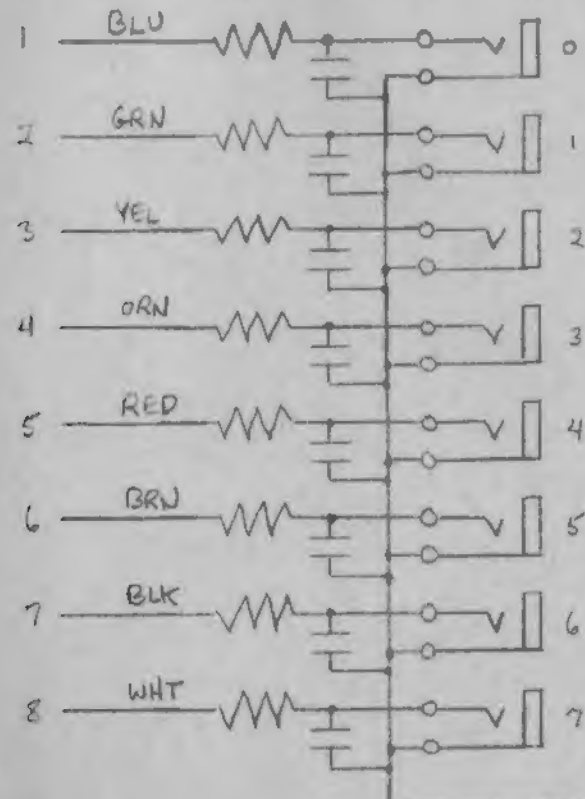
AMPHENOL "D" CONNECTOR

## D/A OUTPUT PANEL

(MINIATURE PHONE JACKS)

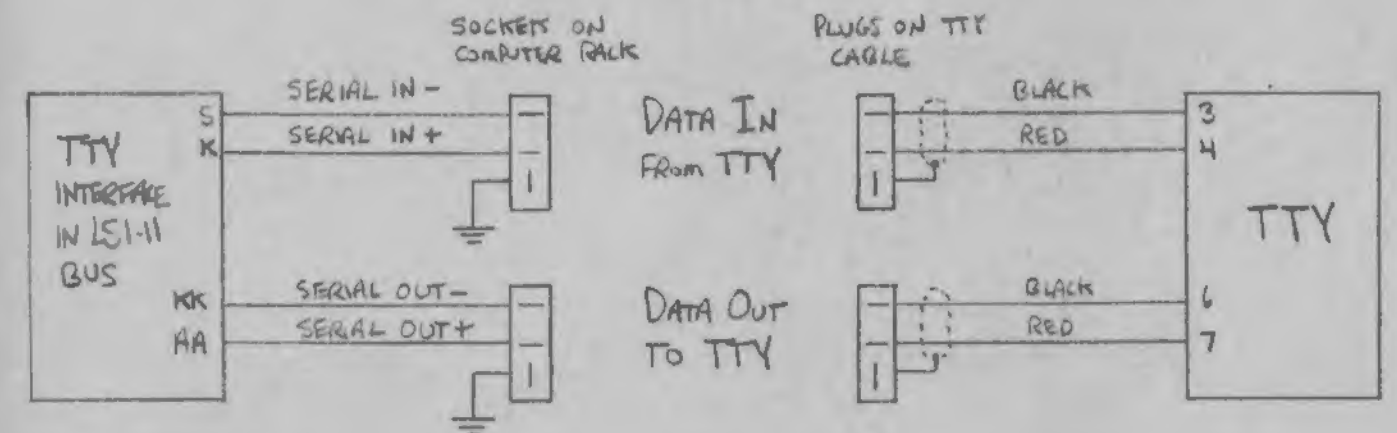
16-PIN DIP PLUG, ALL RESISTORS 1K OHMS

16 PIN DIP PLUG, ALL CAPACITORS .1uF



GROUNDING DIRECTLY TO D/A BOARD

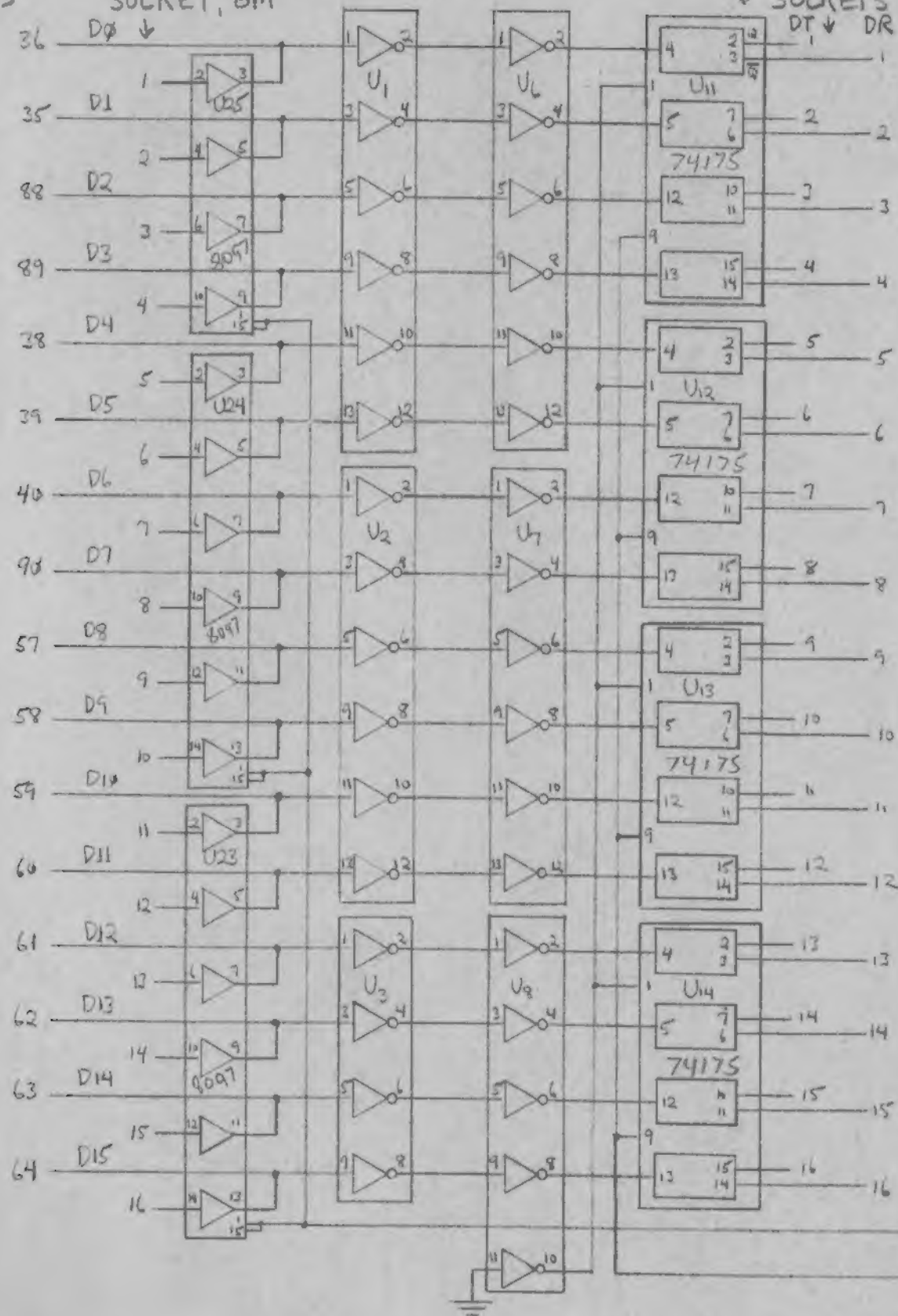
## TTY CONNECTIONS



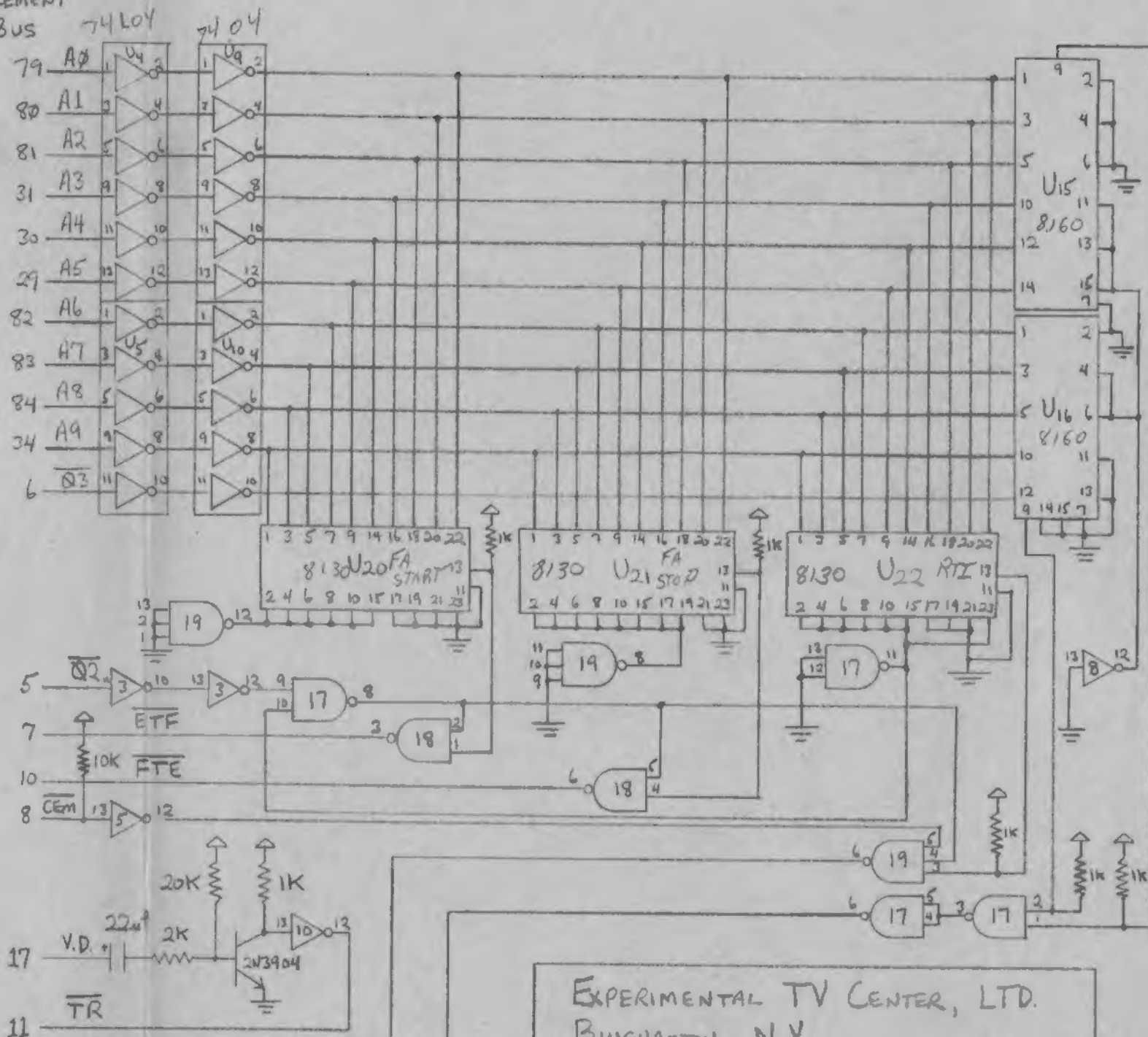
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COMPUTER PROJECT  
MISC. RACK WIRING  
9/77 R.B.

Q outputs Modified see other set

ELEMENT RTI DIP  
BUS SOCKET, BM



ELEMENT  
BUS 74104



BUS  
IND  
SELECT

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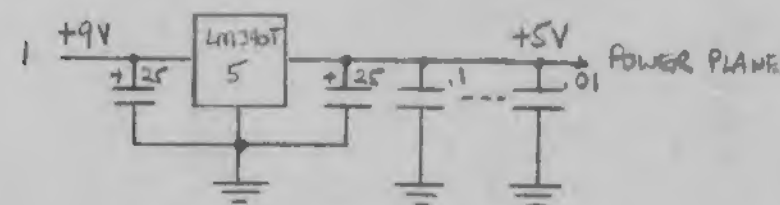
COMPUTER PROJECT:

BUS INDICATOR BOARD, PAGE 1 OF 3

DON McARTHUR 8/77 R.B.

## PARTS LIST

1	VECTOR 8800V UNIVERSAL 100-PIN PLUG-BOARD
12	16-PIN DIP WIRE WRAP SOCKETS
13	14-PIN DIP " " "
3	24-PIN DIP " " "
1	HEAT SINK FOR REGULATOR
1	LM340T-5 REGULATOR
1	2N3904 NPN TRANSISTOR
1	SN7400N QUAD 2-INPUT NAND
1	SN7403N QUAD 2-INPUT NAND, OPEN COLLECTOR
1	SN7410N TRIPLE 3-INPUT NAND
5	SN7404N HEX INVERTER
5	SN74L04N HEX INVERTER
4	SN74175N QUAD D FLIP FLOP
3	DM8097N TRI-STATE HEX BUFFER
3	DM8130N 10-BIT COMPARATOR
2	DM8160N 6-BIT COMPARATOR
3	22 $\mu$ f 25V ELECTROLYTIC CAPACITOR
3	.1 $\mu$ f 35V TANTALUM CAPACITOR
10	.01 $\mu$ f 100V MYLAR CAPACITOR
6	1K 1/4 WATT RESISTOR
1	2K 1/4 WATT RESISTOR
1	20K 1/4 WATT RESISTOR



NUMBER	CHIP	LOCATION	V <sub>CC</sub> PIN	GND PIN
U <sub>1</sub>	74L04	AV	14	7
U <sub>2</sub>	74L04	AT	14	7
U <sub>3</sub>	74L04	AS	14	7
U <sub>4</sub>	74L04	AR	14	7
U <sub>5</sub>	74L04	AP	14	7
U <sub>6</sub>	7404	BV	14	7
U <sub>7</sub>	7404	BT	14	7
U <sub>8</sub>	7404	BS	14	7
U <sub>9</sub>	7404	BR	14	7
U <sub>10</sub>	7404	BP	14	7
U <sub>11</sub>	74175	CW	16	8
U <sub>12</sub>	74175	CV	16	8
U <sub>13</sub>	74175	CT	16	8
U <sub>14</sub>	74175	CS	16	8
U <sub>15</sub>	8160	CR	16	8
U <sub>16</sub>	8160	CP	16	8
U <sub>17</sub>	7400	CN	14	7
U <sub>18</sub>	7403	CM	14	7
U <sub>19</sub>	7410	CL	14	7
U <sub>20</sub>	8130	DPN	24	12
U <sub>21</sub>	8130	DNM	24	12
U <sub>22</sub>	8130	DML	24	12
U <sub>23</sub>	8097	AN	16	8
U <sub>24</sub>	8097	AM	16	8
U <sub>25</sub>	8097	AL	16	8

## BUFFER MEMORY ADDRESS MAP

170000	
170040	
170076	16 D/A'S
171560	BUS INDICATOR (U <sub>15</sub> , U <sub>16</sub> )
173740	
173742	FEATURE AREA
173770	
173776	

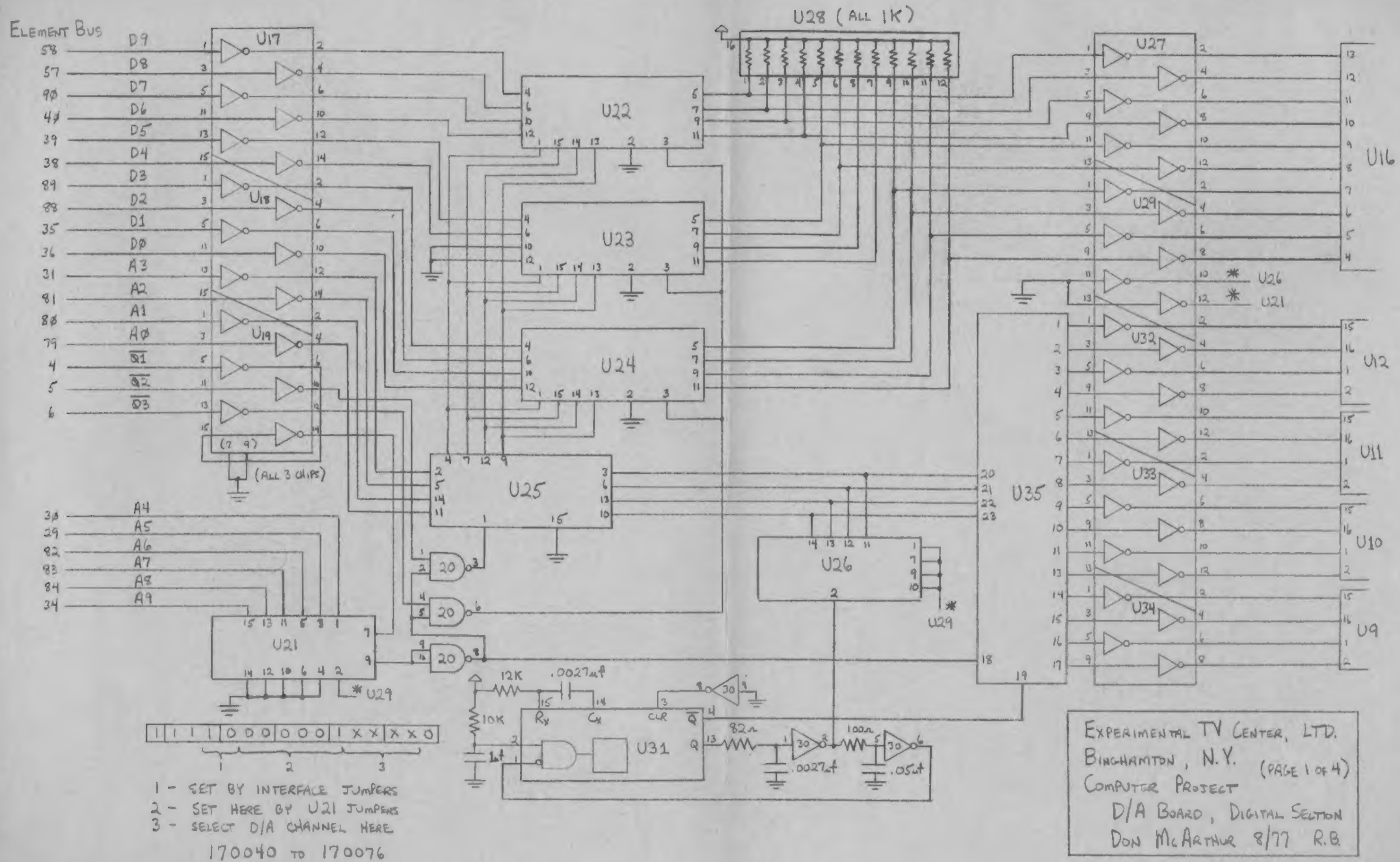
F.A. START (U<sub>20</sub>)  
 REAL TIME INPUT (U<sub>22</sub>)  
 F.A. STOP (U<sub>21</sub>)  
 STATUS REGISTER

## THE FOUR CIRCUITS ON THE BUS INDICATOR CARD

- ① BUS INDICATOR CIRCUIT
- ② BUFFER MEMORY MODE CONTROLLER
- ③ REAL-TIME INPUT CIRCUIT
- ④ V.D. TO TTL CONVERTER

EXPERIMENTAL TV CENTER, LTD  
 BINGHAMTON, N.Y.  
 COMPUTER PROJECT  
 BUS INDICATOR BOARD 8/77  
 DON McARTHUR  
 PAGE 2 OF 3 R.B.









# PARTS LIST

1	VECTOR 8800V UNIVERSAL 100-PIN PLUG-BOARD
26	16-PIN DIP WIRE WRAP SOCKETS
8	14-PIN DIP " " "
1	24-PIN DIP
3	HEAT SINKS
1	LM340T-5 VOLTAGE REGULATOR CHIP
1	LM340T-12 " " "
1	LM320T-12 " " "
1	2N3904 TRANSISTOR (NPN)
1	2N3906 " (PNP)
1	1N4148 DIODES
3	1N4002 DIODES
1	6.8V 1WATT ZENER DIODE
1	SN7400N QUAD 2-INPUT NAND
6	SN7404N HEX INVERTER
3	SN7489N 64-BIT RAM
1	SN74123N MONOSTABLE MULTIVIBRATOR
1	SN74154N 4-LINE TO 16-LINE DEMULTIPLEXER
1	SN74157N QUAD 2:1 DATA SELECTOR
1	SN74161N BINARY COUNTER
1	DM8131N 6-BIT UNIFIED BUS COMPARATOR
3	DM8837N HEX UNIFIED BUS RECEIVER
1	DAC100 10-BIT D/A
1	LM318N HIGH SPEED OP AMP
1	LH0002CN CURRENT AMP
3	AH0015CD QUAD ANALOG SWITCH
16	LM307N OP AMP

## CAPACITORS

2	100 $\mu$ F 25V ELECTROLYTIC
4	22 $\mu$ F 25V " "
1	1 $\mu$ F 50V " "
38	.1 $\mu$ F 35V TANTALUM
1	.05 $\mu$ F DISK
1	.01 $\mu$ F MYLAR
16	.0047 $\mu$ F " "
2	.0027 $\mu$ F DISK
1	47 pF " "
1	10 pF " "
1	5 pF " "

## RESISTORS

2	1K 1/2 WATT 10%
1	12K 1/4 WATT 5%
1	10K " "
1	6.8K " "
1	2.7K " "
1	1K " "
1	100 $\Omega$ " "
1	82 $\Omega$ " "
1	10 $\Omega$ " "
1	500 $\Omega$ TRIMPOT
1	200 $\Omega$ " "

NUMBER	CHIP	LOCATION	+12 PIN	-12 PIN	+5 PIN	GND PIN
U1	2-307	AK	11, 15	4, 8		
U2	2-307	AL	11, 15	4, 8		
U3	2-307	AM	11, 15	4, 8		
U4	2-307	AN	11, 15	4, 8		
U5	2-307	BK	11, 15	4, 8		
U6	2-307	BL	11, 15	4, 8		
U7	2-307	BM	11, 15	4, 8		
U8	2-307	BN	11, 15	4, 8		
U9	AH0015	CK	4	13	14	3
U10	AH0015	CL	4	13	14	3
U11	AH0015	CM	4	13	14	3
U12	AH0015	CN	4	13	14	3
U13	OUT SOCKET	DK				
U14	LH0002	DL	1, 2	4, 5		
U15	LM318	DM	7	4		
U16	DAC100	DN	14	2		
U17	8837	AT			16	8
U18	8837	AY			16	8
U19	8837	AW			16	8
U20	7400	AX			14	7
U21	8131	AY			16	8
U22	7489	BT			16	8
U23	7489	BV			16	8
U24	7489	BW			16	8
U25	74157	BX			16	8
U26	74161	BY			16	8
U27	7404	CT			14	7
U28	PULL-UPS	CV			16	
U29	7404	CW			14	7
U30	7404	CX			14	7
U31	74123	CY			16	8
U32	7404	DT			14	7
U33	7404	DV			14	7
U34	7404	DW			14	7
U35	74154	DX			24	12

EXPERIMENTAL TV CENTER, LTD., BINGHAMTON, N.Y.  
 COMPUTER PROJECT : D/A BOARD (PAGE 3 OF 4)  
 DON MCARTHUR 8/77 R.B.

EXPERIMENTAL TV CENTER, LTD.  
 BINGHAMTON, N.Y.  
 COMPUTER PROJECT 9/77 R.B.  
 BUFFER MEMORY, PAGE 2 OF 3

# PARTS LIST:

- 1 VECTOR 8800V UNIVERSAL 100-PIN PLUGBOARD
- 38 16-PIN DIP WIRE WRAP SOCKETS
- 10 14-PIN " " " "
- 1 24-PIN " " " "
- 4 HEAT SINKS
- 1 BERG H-854 40-PIN CONNECTOR
- 2 LM340T-5 REGULATOR
- 4 SN7400N QUAD 2-INPUT NAND
- 2 SN7402N QUAD 2-INPUT NOR
- 1 SN7404N HEX INVERTER
- 1 SN74S04N SCHOTTKY HEX INVERTER
- 1 SN7430N 8-INPUT NAND
- 1 SN7474N DUAL D FLIP FLOP
- 1 SN74154N 4-LINE TO 16 LINE DECODER
- 3 SN74157N QUAD 2:1 DATA SELECTOR
- 4 SN74161N ASYNCHRONOUS 4-BIT COUNTER
- 8 DM8097N TRI-STATE HEX BUFFER
- 6 N8T97N HIGH-SPEED TRI-STATE HEX BUFFER
- 1 DM8160N 6-BIT COMPARATOR
- 16 21L02 LOW POWER 1024x1 STATIC RAM
- 2 22 $\mu$ F 25V ELECTROLYTIC CAPACITORS
- 2 10 $\mu$ F 50V " "
- 12 .1 $\mu$ F 35V TANTALUM " "
- 1 .01 $\mu$ F 100V MYLAR " "
- 1 .002 $\mu$ F " DISK " "
- 1 .001 $\mu$ F " " " "
- 1 330 pF " SILVER MICA " "
- 2 51  $\Omega$  1/4 WATT RESISTORS
- 3 100  $\Omega$  " " "
- 3 1K " " "
- 3 10K " " "

## POWER CONSUMPTION:

+9VDC @

NUMBER	CHIP	LOCATION	VCC PIN	GND PIN
U <sub>0</sub>	21L02	BCZ	10	9
U <sub>1</sub>	21L02	CY	10	9
U <sub>2</sub>	21L02	CX	10	9
U <sub>3</sub>	21L02	CW	10	9
U <sub>4</sub>	21L02	CV	10	9
U <sub>5</sub>	21L02	CT	10	9
U <sub>6</sub>	21L02	CS	10	9
U <sub>7</sub>	21L02	CR	10	9
U <sub>8</sub>	21L02	BY	10	9
U <sub>9</sub>	21L02	BX	10	9
U <sub>10</sub>	21L02	BW	10	9
U <sub>11</sub>	21L02	BV	10	9
U <sub>12</sub>	21L02	BT	10	9
U <sub>13</sub>	21L02	BS	10	9
U <sub>14</sub>	21L02	BR	10	9
U <sub>15</sub>	21L02	BP	10	9
U <sub>16</sub>	8097	DY	16	8
U <sub>17</sub>	8097	DX	16	8
U <sub>18</sub>	8097	DW	16	8
U <sub>19</sub>	8T97	DV	16	8
U <sub>20</sub>	8T97	DT	16	8
U <sub>21</sub>	8T97	DS	16	8
U <sub>22</sub>	8097	AY	16	8
U <sub>23</sub>	8097	AX	16	8
U <sub>24</sub>	8097	AW	16	8
U <sub>25</sub>	8T97	AV	16	8
U <sub>26</sub>	8T97	AT	16	8
U <sub>27</sub>	8T97	AS	16	8
U <sub>28</sub>	74157	DR	16	8
U <sub>29</sub>	74157	DP	16	8
U <sub>30</sub>	74157	CP	16	8
U <sub>31</sub>	8160	CN	16	8
U <sub>32</sub>	7430	BN	14	7
U <sub>33</sub>	8097	AR	16	8
U <sub>34</sub>	8097	AP	16	8
U <sub>35</sub>	74161	AN	16	8
U <sub>36</sub>	74161	CM	16	8
U <sub>37</sub>	74161	Bm	16	8
U <sub>38</sub>	74161	AM	16	8
U <sub>39</sub>	74154	DNM	24	12
U <sub>40</sub>	7400	DL	14	7
U <sub>41</sub>	7400	CL	14	7
U <sub>42</sub>	7400	BL	14	7
U <sub>43</sub>	7400	AL	14	7
U <sub>44</sub>	7404	DK	14	7
U <sub>45</sub>	7402	CK	14	7
U <sub>46</sub>	7402	BK	14	7
U <sub>47</sub>	74S04	AK	14	7
U <sub>48</sub>	7474	BCT	14	7

BERG H-854			
WIRING VIEW			
SIGNAL	PIN	SIGNAL	PIN
GND	B	A	GND
D <sub>15</sub>	D	C	D <sub>14</sub>
D <sub>13</sub>	F	E	D <sub>12</sub>
D <sub>11</sub>	J	H	D <sub>10</sub>
D <sub>9</sub>	L	K	D <sub>8</sub>
D <sub>7</sub>	N	M	D <sub>6</sub>
D <sub>5</sub>	R	P	D <sub>4</sub>
D <sub>3</sub>	T	S	D <sub>2</sub>
D <sub>1</sub>	V	U	D <sub>0</sub>
GND	X	W	GND
A <sub>15</sub>	Z	Y	A <sub>9</sub>
A <sub>13</sub>	BB	AA	A <sub>7</sub>
A <sub>11</sub>	DD	CC	A <sub>5</sub>
A <sub>9</sub>	FF	EE	A <sub>3</sub>
A <sub>7</sub>	JJ	HH	A <sub>1</sub>
A <sub>5</sub>	LL	KK	A <sub>0</sub>
A <sub>3</sub>	NN	MM	READY
A <sub>1</sub>	PP	PP	INIT
SPARE	RR	SS	SPARE
GND	TT	UU	GND
	VV		